PIGOLA Stefano

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Education and Career

- 2022 - , Full Professore, MAT/03 Geometria, Università di Milano-Bicocca
- 2020 - 2021, Associate Professor, MAT/05 Analisi, Università di Milano-Bicocca
- 2014 - 2020, Associate Professor, MAT/03 Geometria, Università dell'Insubria
- 2005 - 2014, Assistant Professor, MAT/03 Geometria, Università dell'Insubria
- 2004, PhD in Mathematics, Università degli Studi di Milano. Thesis: “Maximum and comparison principles at infinity on Riemannian manifolds”. Advisor: Marco Rigoli.
- 1998/99, B.A. in Mathematics, Università degli Studi di Milano.

Direction of research projects

- 2010: research project entitled *Teoria del potenziale nonlineare su varietà Riemanniane e applicazioni geometriche* funded by GNAMPA (Italy). Team: Stefano Pigola, Michele Rimoldi, Daniele Valtorta, Giona Veronelli. Visiting professors: Marc Troyanov (EPFL).
- 2011–2013: research project entitled *Geometria delle Varietà Riemanniane con Densità* inside the UNIversità-REgione, founded by Regione Lombardia (Italy) with a 2-years postdoc grant.
- 2021: research project entitled *Harmonic Analysis on Continuous and Discrete Structures* founded by Università degli Studi di Milano-Bicocca (Italy) with a 1 year post-doc grant.

Participation to research projects

- PRIN 2005, “Analisi armonica”. PI: Fulvio Ricci
- PRIN 2007, “Analisi armonica”. PI: Fulvio Ricci
- PRIN 2010-2011, “Varietà reali e complesse: geometria, topologia e analisi armonica”. PI: Fulvio Ricci
- PRIN 2015, “Real and Complex Manifolds: Geometry, Topology and Harmonic Analysis”. PI: Fulvio Ricci

Research and teaching assignments

- 2013-2014: visiting researcher for one month, Laboratoire Analyse, Géométrie et Applications, Université Paris 13, France.

Research interests

- Geometric Analysis, Global Analysis, Riemannian Geometry

Preprints

1. B. Güneysu, S. Pigola, P. Stollmann, G. Veronelli, *A new notion of subharmonicity on locally smoothing spaces, and a conjecture by Braverman, Milatovic, Shubin*. Preprint (2023) available at https://arxiv.org/pdf/2302.09423.pdf.
2. S. Pigola, D. Valtorta, G. Veronelli, *Approximation, regularity and positivity preservation on Riemannian manifolds*. Preprint (2023) available at https://arxiv.org/ pdf/2301.05159.pdf.
3. L. Marini, S. Meda, S. Pigola, G. Veronelli, *Lp gradient estimates and Calderón--Zygmund inequalities under Ricci lower bounds*. Preprint (2022) available at https://arxiv.org/pdf/2207.08545.pdf
4. S. Pigola, Global *Calderón-Zygmund inequalities on complete Riemannian manifolds*. Preprint (2020) available at https://arxiv.org/pdf/2011.03220.pdf.

Published papers

1. A. Bisterzo, A. Farina, S. Pigola, *Lp-loc positivity preservation and Liouville-type theorems*. JGEA. To appear.
2. A. Bisterzo, S. Pigola *Symmetry of solutions of semilinear PDEs on Riemannian domains*. Nonlinear Anal. 234 (2023), Paper No. 113320.
3. D. Impera, S. Pigola, M. Rimoldi, *The Frankel property for self-shrinkers from the viewpoint of elliptic PDEs*. J. Reine Angew. Math. 773 (2021), 1–20.
4. S. Pigola, G. Veronelli, *The smooth Riemannian extension problem*. Annali Sc. Norm. Sup. Pisa 20 (2020), 1507–1551.
5. D. Bianchi, S. Pigola, A.G. Setti, *Qualitative properties of bounded subsolutions of nonlinear PDEs*. J. Math. Pures Appl. 144 (2020), 137–163.
6. B. Güneysu, S. Pigola, *Lp-interpolation inequalities and global Sobolev regularity results (with an appendix by Ognjen Milatovic)*. Ann. Mat. Pura Appl. 198 (2019), 83–96.
7. S. Pigola, G. Veronelli, *Sobolev spaces of maps and the Dirichlet problem for harmonic maps*. Commun. Contemp. Math. 21 (2019), 1750091, 22 pp.
8. B. Güneysu, S. Pigola, *Quantitative C1-estimates on manifolds*. Int. Math. Res. Not. IMRN Volume 2018, Issue 13 (2018), 4103–4119.
9. B. Güneysu, S. Pigola, *Nonlinear Calderón-Zygmund inequalities for maps*. Ann. Glob. Anal. Geom. 54 (2018), no. 3, 353–364.
10. D. Impera, J.H. de Lira, S. Pigola, A.G. Setti, *Height estimates for Killing graphs*. J. Geom. Anal. 28 (2018), no. 3, 2857–2885.
11. S.L. Cacciatori, S. Pigola, *Hurewicz fibrations, almost submetries and critical points of smooth maps*. Forum Math. 29 (2017), 751–760.
12. D. Impera, S. Pigola, A.G. Setti, *Potential theory on manifolds with boundary and applications to controlled mean curvature graphs*. J. Reine Angew. Math. 733 (2017), 121–159.
13. L.F. Pessoa, S. Pigola, A.G. Setti, *Dirichlet parabolicity and L1-Liouville property under localized geometric conditions*. J. Funct. Anal. 273 (2017), 652–693.
14. D. Impera, S. Pigola, *On the growth of supersolutions of nonlinear PDE's on exterior domains*. Nonlinear Anal. 146 (2016), 20–31.
15. S. Pigola, G. Veronelli, *On the Dirichlet problem for p-harmonic maps II:*

Cartan- Hadamard targets with special structure. Proc. Amer. Math. Soc. 144 (2016), 3173–3180.
16. S. Pigola, G. Veronelli, *On the Dirichlet problem for p-harmonic maps I: compact targets.* Geom. Dedicata 177 (2015), 307–322.
17. B. Güneysu, S. Pigola, *The Calderón-Zygmund inequality and Sobolev spaces on noncompact Riemannian manifolds*. Adv. Math. 281 (2015), 353–393.
17. G.P. Bessa, J.H. de Lira, A.G. Setti, *Curvature estimates for submanifolds immersed into horoballs and horocylinders*. J. Math. Anal. Appl. 431 (2015), 1000–1007.
18. S. Pigola, A.G. Setti, M. Troyanov, *The connectivity at infinity of a manifold and Lq,p-Sobolev inequalities*. Expositiones Math. 32 (2014), 365–383.
19. S. Pigola, A.G. Setti, *Global divergence theorems in nonlinear PDEs and Geometry*. Ensaios Matematicos 2014, Volume 26, 1–77.
20. S. Pigola, M. Rimoldi, *Complete self-shrinkers confined into some regions of the space*. Annals Global Anal. Geom. 45 (2014), 47–65.
21. G.P. Bessa, S. Pigola, A. G. Setti, *On submanifolds of highly negatively curved spaces*. Internat. J. Math. 25 (2014) 1450055 (15 pages)
22. G.P. Bessa, S. Pigola, A.G. Setti, *On the L1-Liouville property of stochastically incomplete manifolds*. Potential Anal. 39 (2013), 313–324.
23. G.P. Bessa, S. Pigola, A.G. Setti, *Spectral and stochastic properties of the f -Laplacian, solutions of PDEs at infinity and geometric applications*. Rev. Mat. Iberoam. 29 (2013), no. 2, 579–610.
24. S. Pigola, M. Rimoldi, *Characterizations of model manifolds by means of certain differential systems*. Canad. Math. Bull. 55 (2012), no. 3, 632–645.
25. S. Pigola, G. Veronelli, *Remarks on Lp-vanishing results in geometric analysis*. Internat. J. Math. 23 (2012), no. 1, 1250008, 18 pp.
26. S. Pigola, A.G. Setti, *The Feller property on Riemannian manifolds*. J. Funct. Anal. 262 (2012), no. 5, 2481–2515.
27. S. Pigola, M. Rigoli, M. Rimoldi, A.G. Setti, *Ricci almost solitons*. Ann. Sc. Norm. Super. Pisa Cl. Sci. (5) 10 (2011), no. 4, 757–799.
28. S. Pigola, M. Rimoldi, A.G. Setti, *Remarks on non-compact gradient Ricci solitons*. Math. Z. 268 (2011), no. 3-4, 777–790.
29. I. Holopainen, S. Pigola, G. Veronelli, *Global comparison principles for the p-Laplace operator on Riemannian manifolds*. Potential Anal. 34 (2011), 371–384.
30. S. Pigola, G. Veronelli, *Uniform decay estimates for finite-energy solutions of semi- linear elliptic inequalities and geometric applications*. Differential Geom. Appl. 29 (2011), 35–54.
31. S. Pigola, G. Veronelli, *Lower volume estimates and Sobolev inequalities*. Proc. Amer. Math. Soc. 138 (2010), 4479–4486.
32. S. Pigola, G. Veronelli, *On the homotopy class of maps with finite p-energy into non-positively curved manifolds*. Geom. Dedicata 143 (2009), 109–116.
33. S. Pigola, M. Rigoli, A.G. Setti, *Aspects of potential theory on manifolds, linear and non-linear*. Milan J. Math. 76 (2008), 229–256.
34. S. Pigola, M. Rigoli, A.G. Setti, *A finiteness theorem for the space of Lp harmonic sections*. Rev. Mat. Iberoam. 24 (2008), no. 1, 91–116.
35. S. Pigola, M. Rigoli, A.G. Setti, *Constancy of p-harmonic maps of finite q-energy into non-positively curved manifolds*. Math. Z. 258 (2008), 347–362.

36. S. Pigola, M. Rigoli, A.G. Setti, *Some characterizations of space-forms*. Trans. Amer. Math. Soc. 359 (2007), 1817–1828; 360 (2008), 3943–3944.
37. S. Pigola, M. Rigoli, A.G. Setti, *Maximum principles at infinity on Riemannian manifolds: an overview*. Workshop on Differential Geometry Mat. Contemp. 31 (2006), 81–128.
38. S. Pigola, M. Rigoli, A.G. Setti, *Some non-linear function theoretic properties of Riemannian manifolds*. Rev. Mat. Iberoam. 22 (2006), 801–831.
39. S. Pigola, M. Rigoli, A.G. Setti, *Vanishing theorems on Riemannian manifolds, and geometric applications*. J. Funct. Anal. 229 (2005), 424–461.
40. S. Pigola, M. Rigoli, A.G. Setti, *Maximum principles on Riemannian manifolds and applications*. Mem. Amer. Math. Soc. 174 (2005), no. 822.
41. S. Pigola, M. Rigoli, A.G. Setti, *Some applications of integral formulas in Rieman-nian geometry and PDE's*. Milan J. Math. 71 (2003), 219–281.
42. S. Pigola, M. Rigoli, A.G. Setti, *A remark on the maximum principle and stochastic completeness*. Proc. Amer. Math. Soc. 131 (2003), 1283–1288.
43. S. Pigola, M. Rigoli, A.G. Setti, *Maximum principles and singular elliptic inequalities*. J. Funct. Anal. 193 (2002), no. 2, 224–260.
44. S. Pigola, M. Rigoli, A.G. Setti, *Some remarks on the prescribed mean curvature equation on complete manifolds*. Pacific J. Math. 206 (2002), no. 1, 195–217.

Published books

1. S. Pigola, M. Rigoli, A.G. Setti, *Vanishing and finiteness results in geometric analysis. A generalization of the Bochner technique*. Progress in Mathematics, 266. Birkhäuser Verlag, Basel, 2008.

Selected talks and mini-courses

- *Some vanishing and finiteness results on complete manifolds: a generalization of the Bochner technique*. Caramanico Terme, May 2007. Convegno Nazionale di Analisi Armonica.
- *Some analytic and geometric aspects of the p-Laplacian on Riemannian manifolds*. Bardonecchia, June 2009. Convegno Nazionale di Analisi Armonica.
- *p-Laplacian and topology of manifolds.* Santiago de Compostela, December 2010. Conference in Geometry and Global Analysis.
- *Global divergence theorems in nonlinear PDEs and Geometry*. Fortaleza, January 2012. Mini-course for the Summer School in Differential Geometry.
- *Stochastic properties of manifolds: Liouville-type aspects*. Maceiò, February 2012. II workshop of Differential Geometry.
- *Height estimates for graphs of constant mean curvature*. A meeting with Louis Nirenberg, Varese 10-13 June 2014.
- *Some geometric aspects of parabolicity, stochastic completeness and Feller property*. Topics in Geometric Analysis, Potsdam, June 19th 2014.
- *Geometric aspects of recurrence, non-explosion and Feller property of a Riemannian manifold*. XVIII Escola de Geometria Diferencial, Brasilia, July 28th-1st August 2014.
- *The Dirichlet problem for harmonic maps into convex supporting balls*. Workshop 2015, Varietà reali e complesse: geometria, topologia e analisi

armonica. SNS di Pisa, 5-7 March, 2015.

- *Extending manifolds past their boundaries*. A Differential Geometry Day in memory of Sergio Console. Torino, 13 May 2016.
- *Riemannian manifolds with boundary and smooth domains*. Geometric Analysis in Samothrace, a tribute to Gerard Besson. May 30-June 4, 2016.
- *Potential theory on Riemannian manifolds: some recent results and possible perspectives*. Workshop on Geometry, Analysis and Probability. Beijing, October 26--30, 2017.
- *Halfspace and intersection properties of weighted minimal hypersurfaces in the Gaussian space*. Recent Trends in Geometric Analysis and Applications. SNS Pisa, November 25-28, 2019.
- *On the global W^{2,p} regularity of solutions of the Poisson equation on complete manifolds*. Seminaire Théorie Spectrale et Géométrie, Grenoble, February 20, 2020.
- *Global Lp elliptic estimates on Riemannian manifolds*. Real analysis and geometry. Minicourse held at CIRM, Luminy, June 12-16, 2023.

PhD students under my direction

- Giona Veronelli, with a thesis entitled *Some analytic and geometric aspects of the p-Laplacian on Riemannian manifolds*, 2010.
- Michele Rimoldi, with a thesis entitled *Rigidity results for Lichnerowicz-Bakry-Emery Ricci tensors*, 2011.
- Andrea Bisterzo started his PhD program in 2019. He is currently working on symmetry of solutions of semilinear PDEs and maximum principles on unbounded domains in Riemannian manifolds.

Post-doc students under my supervision

- Davide Bianchi, 2018 - 2019. Post-doc for 1 year working on the following project: *A nonlinear Feller property in complete manifolds with applications to the qualitative study of positive and bounded solutions at infinity of nonlinear PDEs driven by the p-Laplacian*.
- Leandro de Freitas Pessoa, 2015 - 2016. Post-doc for 10 months with Brazilian grant, working on the following project: *Localized geometric conditions fo the validity of an L1 Liouville property for superharmonic functions*.
- Michele Rimoldi, 2011 - 2013. Post-doc for 2 years working on the following project*: Analytic and geometric aspects of manifolds with density with applications to Ricci solitons*.

Professional services

Referee for: Note di Matematica, American Journal of Mathematics, Manuscripta Mathematica, Journal of Differential Equations, Journal of Mathematical Analysis and Applications, Journal of Geometry and Physics, Communications in Contemporary Mathematics, Monatshefte fur Mathematik, Geometriae Dedicata, Journal of Geometric Analysis, Differential Geometry and its Applications, Publicationes Mathematicae Debrecen, Annali della Scuola Normale Superiore di Pisa, Potential

Analysis, Journal of Differential Equations, Annals of Global Analysis and Geometry, Paciffic Journal of Mathematics, Journal of Nonlinear Analysis, International Mathematics Research Notices.

Organization of scientific meetings

- *Geometry in Bicocca*. A two days conference devoted to various aspects of geometry. September 11-12, 2023.
- *A Geometry Day in Como*. A one-day Workshop that took place regularly from 2013 to 2019 in the first half of January at the Università dell'Insubria.
- *Geometric Analysis on Riemannian and Singular Metric Measure Spaces*. Summer School at Villa del Grumello in Como. Editions
  - 2013: https://gams.lakecomoschool.org
  - 2016: https://arms.lakecomoschool.org
  - 2019: https://arms2019.lakecomoschool.org
- *Einstein Equations: Physical and Mathematica Aspects of General Relativity*. Summer school at Collegio Rosmini in Domodossola. Editions
  - 2018: http://www.univco.it/domoschool/Edition-2018
  - 2019: http://www.univco.it/domoschool/edition-2019
- *Topologia e Geometria Differenziale*. Special Session, XXI Congresso UMI, 2019.

Memberships of scientific societies

- 2016–today: member of the Unione Matematica Italiana, Italy.
- 2009–today: member of the Italian group GNAMPA, INdAM, Italy.
- 2018–today: member of the scientific board of the DOMOSCHOOL - International Alpine School of Mathematics and Physics, Italy.

Last updated: October 2023